

Department of Chemical Engineering

College of Engineering

King Saud University

CHE 407: Separation Processes
Second Semester (1439/1440H)

LAB

CONTINUOUS DISTILLATION COLUMN EXPERIMENT

DATE: / /

GROUP:.....

	ID	NAME
1		
2		
3		
4		
5		
6		

Objectives

1. Development of the calibration curve of the system (physical property vs. known mole fractions)
2. To determine the overall column efficiency at total reflux.
3. To investigate the steady state distillation of a binary mixture at constant reflux ratio and feed condition in order to relate the theory and experimental results.
 - 3.1 Plot of T-X-Y diagram of the system.
 - 3.2 To determine the number of theoretical plates.
 - 3.3 To determine the composition and temperature of each plate.
 - 3.4 To determine the heat duty (load) of the condenser (q_c) and the reboiler (q_r).

1. Calibration curve of the system

2. The overall column efficiency

$$\text{Overall efficiency} = \frac{\text{Number of theoretical stages}}{\text{Number of actual stages}}$$

$$\text{Reflux Ratio} = R = \frac{L_o}{D}$$

Where L_o is the reflux flow rate and D is the distillate flow rate. Use the total reflux or infinite reflux ratio (which results in **minimum** number of stages). Total reflux meaning the condensed vapor will return to the column.

Table 1: Time and temperatures from the apparatus at total reflux

t (min)	T1 (°C)	T2 (°C)	T3 (°C)	T4 (°C)	T5 (°C)	T6 (°C)	T7 (°C)	T8 (°C)	T9 (°C)	T10 (°C)	T11 (°C)	T12 (°C)
0												
5												
10												
15												
20												
25												

When steady state is reached, the temperatures T1- T9 have reached an average steady temperature.

Table 2: Samples at total reflux

	Physical property:.....		
	Water flow rate (cm ³ /min)	Reflux (Distillate)	Bottoms
Student 1			
Student 2			
Student 3			
Student 4			
Student 5			
Student 6			
Average			

Exp. Supervisor Name:..... Signature:.....

3. Constant reflux ratio experiment

Use the reflux ratio (R) of to 5 : 1; meaning 5 sec back to column and 1 sec to top product. The feed to the column must be admitted at the mid-point.

Table 3: Time and temperatures from the apparatus at R=5:1

t (min)	T1 (°C)	T2 (°C)	T3 (°C)	T4 (°C)	T5 (°C)	T6 (°C)	T7 (°C)	T8 (°C)	T9 (°C)	T10 (°C)	T11 (°C)	T12 (°C)
0												
5												
10												
15												
20												
25												

Table 4: Samples at R=5:1

	Physical property:.....		
	Feed	Distillate	Bottoms
Student 1			
Student 2			
Student 3			
Student 4			
Student 5			
Student 6			
Average			

Exp. Supervisor Name:..... Signature:.....